

FORM PTO-1390 (REV. 11-2000)		U S DEPARTMENT OF COMMERCE PATENT AND TRADEMARK OFFICE		ATTORNEY'S DOCKET NUMBER 146154.00000
TRANSMITTAL LETTER TO THE UNITED STATES DESIGNATED/ELECTED OFFICE (DO/EO/US) CONCERNING A FILING UNDER 35 U.S.C. 371				U.S. APPLICATION NO. (If known, see 37 CFR 1.5 09 / 857357
INTERNATIONAL APPLICATION NO. PCT/EP99/09310	INTERNATIONAL FILING DATE 30 November 1999		PRIORITY DATE CLAIMED 3 December 1998	
TITLE OF INVENTION DEVICE FOR ADJUSTING A GAP				
APPLICANT(S) FOR DO/EO/US HOECHST TRESPAPHAN GMBH, Bergstrasse, Neunkirchen				
Applicant herewith submits to the United States Designated/Elected Office (DO/EO/US) the following items and other information:				
<p>1. <input checked="" type="checkbox"/> This is a FIRST submission of items concerning a filing under 35 U.S.C. 371.</p> <p>2. <input type="checkbox"/> This is a SECOND or SUBSEQUENT submission of items concerning a filing under 35 U.S.C. 371.</p> <p>3. <input type="checkbox"/> This is an express request to begin national examination procedures (35 U.S.C. 371(f)). The submission must include items (5), (6), (9) and (21) indicated below.</p> <p>4. <input checked="" type="checkbox"/> The US has been elected by the expiration of 19 months from the priority date (Article 31).</p> <p>5. <input checked="" type="checkbox"/> A copy of the International Application as filed (35 U.S.C. 371(c)(2)) <ul style="list-style-type: none"> a. <input type="checkbox"/> is attached hereto (required only if not communicated by the International Bureau). b. <input checked="" type="checkbox"/> has been communicated by the International Bureau. c. <input type="checkbox"/> is not required, as the application was filed in the United States Receiving Office (RO/US). </p> <p>6. <input type="checkbox"/> An English language translation of the International Application as filed (35 U.S.C. 371(c)(2)). <ul style="list-style-type: none"> a. <input type="checkbox"/> is attached hereto. b. <input type="checkbox"/> has been previously submitted under 35 U.S.C. 154(d)(4). </p> <p>7. <input checked="" type="checkbox"/> Amendments to the claims of the International Application under PCT Article 19 (35 U.S.C. 371(c)(3)) <ul style="list-style-type: none"> a. <input type="checkbox"/> are attached hereto (required only if not communicated by the International Bureau). b. <input type="checkbox"/> have been communicated by the International Bureau. c. <input type="checkbox"/> have not been made; however, the time limit for making such amendments has NOT expired. d. <input checked="" type="checkbox"/> have not been made and will not be made. </p> <p>8. <input type="checkbox"/> An English language translation of the amendments to the claims under PCT Article 19 (35 U.S.C. 371(c)(3)).</p> <p>9. <input type="checkbox"/> An oath or declaration of the inventor(s) (35 U.S.C. 371(c)(4)).</p> <p>10. <input type="checkbox"/> An English language translation of the annexes of the International Preliminary Examination Report under PCT Article 36 (35 U.S.C. 371(c)(5)).</p>				
Items 11 to 20 below concern document(s) or information included:				
<p>11. <input checked="" type="checkbox"/> An Information Disclosure Statement under 37 CFR 1.97 and 1.98.</p> <p>12. <input type="checkbox"/> An assignment document for recording. A separate cover sheet in compliance with 37 CFR 3.28 and 3.31 is included.</p> <p>13. <input type="checkbox"/> A FIRST preliminary amendment.</p> <p>14. <input type="checkbox"/> A SECOND or SUBSEQUENT preliminary amendment.</p> <p>15. <input type="checkbox"/> A substitute specification.</p> <p>16. <input type="checkbox"/> A change of power of attorney and/or address letter.</p> <p>17. <input type="checkbox"/> A computer-readable form of the sequence listing in accordance with PCT Rule 13ter.2 and 35 U.S.C. 1.821 - 1.825.</p> <p>18. <input type="checkbox"/> A second copy of the published international application under 35 U.S.C. 154(d)(4).</p> <p>19. <input type="checkbox"/> A second copy of the English language translation of the international application under 35 U.S.C. 154(d)(4).</p> <p>20. <input checked="" type="checkbox"/> Other items or information: Express Mail Certificate, Return Postcard, Preliminary Amendment, IDS, 4 SHEETS OF DRAWINGS; WO 00/32375; DE 37 31 961; US 4 781 562; DE 38 34 719; PCT FORM 101; PCT FORM 304; Int. Prel Exam. Report; Int. Search Report; Commercial Register Evidencing Change of Name</p>				
Check for Fees totaling \$860.00				

U.S. APPLICATION NO. (if known, see 37 CFR 1.5)	INTERNATIONAL APPLICATION NO.	ATTORNEY'S DOCKET NUMBER		
<p>21. <input checked="" type="checkbox"/> The following fees are submitted:</p> <p>BASIC NATIONAL FEE (37 CFR 1.492 (a) (1) - (5)):</p> <p>Neither international preliminary examination fee (37 CFR 1.482) nor international search fee (37 CFR 1.445(a)(2)) paid to USPTO and International Search Report not prepared by the EPO or JPO..... \$1000.00</p> <p>International preliminary examination fee (37 CFR 1.482) not paid to USPTO but International Search Report prepared by the EPO or JPO \$860.00</p> <p>International preliminary examination fee (37 CFR 1.482) not paid to USPTO but international search fee (37 CFR 1.445(a)(2)) paid to USPTO \$710.00</p> <p>International preliminary examination fee (37 CFR 1.482) paid to USPTO but all claims did not satisfy provisions of PCT Article 33(1)-(4) \$690.00</p> <p>International preliminary examination fee (37 CFR 1.482) paid to USPTO and all claims satisfied provisions of PCT Article 33(1)-(4) \$100.00</p> <p>ENTER APPROPRIATE BASIC FEE AMOUNT =</p>		CALCULATIONS PTO USE ONLY		
		\$ 860.00		
<p>Surcharge of \$130.00 for furnishing the oath or declaration later than <input type="checkbox"/> 20 <input type="checkbox"/> 30 months from the earliest claimed priority date (37 CFR 1.492(e)).</p>		\$ 0.00		
CLAIMS	NUMBER FILED	NUMBER EXTRA	RATE	\$
Total claims	15 - 20 =		x \$18.00	\$ 0.00
Independent claims	2 - 3 =		x \$80.00	\$ 0.00
MULTIPLE DEPENDENT CLAIM(S) (if applicable)			+ \$270.00	\$ 0.00
		TOTAL OF ABOVE CALCULATIONS =	\$ 860.00	
<input type="checkbox"/> Applicant claims small entity status. See 37 CFR 1.27. The fees indicated above are reduced by 1/2.		+ \$ 0.00		
		SUBTOTAL =	\$ 860.00	
<p>Processing fee of \$130.00 for furnishing the English translation later than <input type="checkbox"/> 20 <input type="checkbox"/> 30 months from the earliest claimed priority date (37 CFR 1.492(f)).</p>		\$		
		TOTAL NATIONAL FEE =	\$ 860.00	
<p>Fee for recording the enclosed assignment (37 CFR 1.21(h)). The assignment must be accompanied by an appropriate cover sheet (37 CFR 3.28, 3.31). \$40.00 per property</p>		+ \$		
		TOTAL FEES ENCLOSED =	\$ 860.00	
		Amount to be refunded:	\$	
		charged:	\$	
<p>a. <input checked="" type="checkbox"/> A check in the amount of \$ <u>860.00</u> to cover the above fees is enclosed.</p> <p>b. <input type="checkbox"/> Please charge my Deposit Account No. _____ in the amount of \$ _____ to cover the above fees. A duplicate copy of this sheet is enclosed.</p> <p>c. <input checked="" type="checkbox"/> The Commissioner is hereby authorized to charge any additional fees which may be required, or credit any overpayment to Deposit Account No. <u>50-1682</u>. A duplicate copy of this sheet is enclosed.</p> <p>d. <input type="checkbox"/> Fees are to be charged to a credit card. WARNING: Information on this form may become public. Credit card information should not be included on this form. Provide credit card information and authorization on PTO-2038.</p>				
<p>NOTE: Where an appropriate time limit under 37 CFR 1.494 or 1.495 has not been met, a petition to revive (37 CFR 1.137 (a) or (b)) must be filed and granted to restore the application to pending status.</p>				
<p>SEND ALL CORRESPONDENCE TO:</p> <p>POWELL, GOLDSTEIN, FRAZER & MURPHY LLP PO Box 97223 1001 Pennsylvania, Ave., NW Washington, DC 20090-7223</p>				
<p><u>David W. Woodward</u> SIGNATURE David W. Woodward</p>				
<p>NAME 35,020</p>				
<p>REGISTRATION NUMBER Dated: June 1, 2001</p>				

IN THE UNITED STATES PATENT AND TRADEMARK OFFICE

Attorney Docket No. 146154.00000

Group Art Unit:)
Examiner:)
Inventor: FREYNHOFER, et al.) **PRELIMINARY**
Serial No.)
Filed: June 1, 2001)
For: DEVICE FOR ADJUSTING A GAP) **AMENDMENT**

)

Hon. Commissioner of Patents
and Trademarks
Washington, D.C. 20231

Sir:

Please amend the application as follows:

IN THE CLAIMS

Claims 3-7, 9 and 12 have been rewritten to depend on claim 1 to avoid multiple dependent claims.

3. Device according to claim 1, characterized in that the bore (4) of the thermopin is provided between the tapered end and the groove (5) of the thermopin.

4. Device according to claim 1, characterized in that a comb strip (14) is attached to the die lip (10), and the thermopins (1) are inserted between the individual teeth of the comb strip (14) on fixing to the die lip (10).

5. Device according to claim 1, characterized in that the comb strip (14) is a separate part which is reversibly fixed to the die lip (10).

6. Device according to claim 1, characterized in that the thermopin (1) is surrounded by a coil-type heating/cooling cartridge (19).

7. Device according to claim 1, characterized in that the coil-type heating/cooling cartridge warms the thermopin via an electric, spirally open wound heating coil.

9. Device according to claim 1, characterized in that the thermopin has, at the upper end remote from the die lip, an external thread via which it is connected to a horizontal retention strip (18), the retention strip having a corresponding bore with internal thread.

12. Method for adjusting the gap of a slot die, characterized in that the change in the height of the die gap is carried out using thermopins according to claim 1.

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REMARKS

Attached hereto is a marked-up version of the changes made to the claims by the current amendment. The attached page is captioned "**VERSION WITH MARKINGS TO SHOW CHANGES MADE**".

Entry of the Amendment is respectfully requested.

Respectfully submitted,



David W. Woodward
Registration No. 35,020
Attorney for Applicant

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Dated: June 1, 2001

DWW/db

F O R T E N N E Y C O M P A C T S

VERSION WITH MARKINGS TO SHOW CHANGES MADEIN THE CLAIMS:

Claim 3-7, 9 and 12 have been amended as follows:

3. Device according to [one or more of Claims 1 and/or 2,] claim 1, characterized in that the bore (4) of the thermopin is provided between the tapered end and the groove (5) of the thermopin.

4. Device according to [one or more of Claims 1 to 3,] claim 1, characterized in that a comb strip (14) is attached to the die lip (10), and the thermopins (1) are inserted between the individual teeth of the comb strip (14) on fixing to the die lip (10).

5. Device according to [one or more of Claims 1 to 4,] claim 1, characterized in that the comb strip (14) is a separate part which is reversibly fixed to the die lip (10).

6. Device according to [one or more of Claims 1 to 5,] claim 1, characterized in that the thermopin (1) is surrounded by a coil-type heating/cooling cartridge (19).

7. Device according to [one or more of Claims 1 to 6,] claim 1, characterized in that the coil-type heating/cooling cartridge warms the thermopin via an electric, spirally open wound heating coil.

9. Device according to [one or more of Claims 1 to 8,] claim 1, characterized in that the thermopin has, at the upper end remote from the die lip, an external thread via which it is connected to a horizontal retention strip (18), the retention strip having a corresponding bore with internal thread.

12. Method for adjusting the gap of a slot die, characterized in that the change in the height of the die gap is carried out using thermopins according to [one of Claims 1 to 9] claim 1.

4/PRTS

Device for adjusting a gap

- The invention relates to a device for adjusting the gap of a die arrangement using a thermopin (1), in which the thermopin is connected to the die lip 5 (10) without any play.

In the production of films, tapes, sheets and similar two-dimensional, continuously shaped extrudates of thermoplastics, a plastic melt is generally extruded through a slot die to give a surface having a rectangular cross 10 section. It is important here to set a controlled thickness profile of the extrudate by adjusting the die gap. The thickness profile is important for subsequent process steps, such as, for example, stacking of sheets, winding of film webs or, for example, stretching of films, thermoforming of sheets, etc. For stretched films in particular, a uniform thickness profile of the 15 final film over the entire width depends on the thickness profile of the precursor film.

It is known to adjust the height of the die gap or its profile by bending the die lip. The fine adjustment is frequently carried out by means of so-called 20 thermopins. These thermopins expand on heating and exert a mechanical force on the die lip, causing the latter to deform. Conversely, the thermopin contracts on cooling, causing tension on the die lip at the corresponding point and thus an increase in the die gap.

25 For precise adjustment of the die gap by means of thermopins, it is important that the thermopin is connected to the die lip without any play. If there is excessive play, the heating or cooling of the thermopin in some cases does not result in deformation of the lip, but instead the change in the length of the thermopin is partly lost in the play of the arrangement and 30 has no effect. Thermopins therefore have to act on the die lip as directly as possible and without any play.

Known play-free die arrangements with thermopins are afflicted by the disadvantage that they do not facilitate simple exchange of individual 35 thermopins. DE 38 34 719 describes a device which has a bore in a die

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projection, this die projection being an integral part of the die. This connection mechanism may be damaged in operation and may wear. Deficiencies of this type cannot be eliminated since the die projection is an integral part of the die lip. The known device results in premature unusability of the entire die. Furthermore, die deformation by means of a connection mechanism of this type is not sufficiently precise, since the integral die projection results in a stiffening of the die lip.

- 5 The object of the present invention was therefore to provide a device for adjusting the gap of a die using thermopins which ensures easy removability of individual thermopins and a play-free connection between the thermopins and the die lip and facilitates precise deformation of the die lip using thermopins.
- 10 15 20 25 The object is achieved in accordance with the invention by a device for adjusting the gap of a die arrangement using a thermopin, in which the thermopin is connected to the die lip (10) without any play and this play-free fixing of the thermopin (1) to the die lip (10) is effected by means of a clamp-type socket (7), where the said clamp-type socket (7) engages on the one hand in a lip nose (11) and on the other hand in a groove (5) of the thermopin (1), where the lip nose (11) is an integral part of the die lip (10) and the clamp-type socket (7) has a bore (8) and the thermopin (1) has a bore (4) and a fixing means is passed through the bores (8) and (4).
- The sub-claims define preferred embodiments of the device.
The invention is explained below with reference to the embodiments shown in the drawings. The figures show in detail:

30 Fig. 1 shows a diagrammatic cross-sectional view of the die arrangement according to the invention transverse to the longitudinal direction of the slot die [lacuna] the entire device consisting of die (10 and 10a), thermopin (1), clamp-type socket (7), coil-type heating/cooling cartridge (19) and terminal box (18).

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Fig. 2 shows a cross-sectional view of the thermopin with coil-type heating-cooling cartridge fixed to the die lip.

Fig. 3 shows a side view of the thermopin.

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Fig. 4 shows a front view of the thermopin.

Fig. 5 shows a side cross-sectional view of the clamp-type socket.

10 Fig. 6 shows a front view of the clamp-type socket.

Fig. 7 shows a view of the comb strip with thermopin.

Fig. 8 shows a plan view of the clamp strip with partial longitudinal section.

15

Fig. 2 shows the cross section of an adjustment system arrangement. A die lip (10) and a lower die lip (10a) form a die gap (12), whose height can be adjusted with the aid of a thermopin (1). An integral lip nose (11) with groove (13) in the direction of the die gap opening is mounted on the die lip (10).

20 The thermopin (1) is fixed to the die lip (10) at the lip nose (11) by means of a removable clamp-type socket (7). The thermopin (1) has at the lower end (2), i.e. the end facing the die lip (10), a shape which enables the thermopin (1) to be fixed without any play to the lip nose (11) of the die lip (10) by means of the clamp-type socket (7). The shape of the lower end of
25 the thermopin (2) is shown separately in Fig. 3 and is characterized by the following three preferred features:

1. The lower end of the thermopin (2), which is in contact with the lip nose (11) and exerts pressure on the die lip (10) via the lip nose (11) on expansion of the thermopin (1), tapers off and preferably terminates in a pointed tip (3), which ensures a minimal contact area between the thermopin (1) and the lip nose (11).

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2. A bore (4) is provided above the tapered end, optionally with internal thread, by means of which a detachable fixing means, such as, for example, a screw or a bolt, can be attached.
- 5 3. A groove (5), preferably with a planar surface (6) running at an angle to the orientation of the thermopin (1), is provided above the bore (4) and achieves a non-positive connection between the clamp-type socket (7) and the thermopin (1).
- 10 The removal clamp-type socket (7) is shown in Figs. 5 and 6 and has a shape with precisely fitting surfaces (9), which ensure a non-positive connection firstly with the inclined groove (5) of the thermopin, in particular with the planar surface (6) of the groove (5), and secondly with the groove (13) of the lip nose (11). The clamp-type socket (7) additionally has a bore 15 (8), through which a fixing means is passed and which lines up with the bore (4) of the thermopin (1).
- In order to fix the thermopin (1) to the die lip (10), the thermopin (1) is placed on the lip nose (11) in such a way that the groove (5) of the thermopin (1) is oriented in the direction of the die gap opening, i.e. to the front. The clamp-type socket (7) is inserted into the groove (13) of the lip nose (11) and into the groove (5) of the thermopin (1) and fixed by means 20 of a screw or equivalent fixing means, the fixing means being passed through the bore (8) of the clamp-type socket (7) and through the bore (4) of the thermopin (1) and fixed. The clamp-type socket (7) pulls the thermopin (1) downwards, i.e. in the direction of the lip nose (11), so that the thermopin (1) finally sits firmly on the lip nose (11) through its tapered tip (3) and is connected without any play to the lip nose (11) by means of the clamp-type socket (7).
- 25 30 The tapered shape of the lower end of the thermopin (2) means that the individual thermopins (1) are at no point lined up flush against one another. An interspace, which does not occur in known arrangements, is formed between the individual thermopins (1). For example, the claws in DE 38 34 35 719 are flush against one another. The interspace of the device according

to the invention can result in the thermopins (1) rotating in an undesired manner during adjustment. Therefore, in a preferred embodiment of the device according to the invention, a comb strip (14), as shown in detail in Fig. 7, is provided, which is possibly an integral part of the die lip (10) or is 5 preferably in the form of a separate part and is screwed to the die lip (10), as shown in Fig. 2. The comb strip (14) is aligned in such a way here that the row of teeth (15) faces the front, i.e. in the direction of the die opening. The row of teeth (15) of the comb strip (14) is shaped in such a way that the thermopins (1) are inserted with their lower ends (2) into the 10 interspaces of the row of teeth (15) on attachment by means of the clamp-type socket (7) (Fig. 7) and, with the clamp-type sockets (7), sit in a precisely fitting manner between the individual teeth (15) of the comb strip (14). This effectively prevents rotation of the thermopins (1) during adjustment. If necessary, the rotation prevention measure can also be 15 supported by means of a suitable shape of the lower end of the thermopin (2).

In accordance with the prior art, the thermopins sit on the die lip at constant intervals over the entire width of the die lip; correspondingly, these 20 embodiments require use of a comb strip which has a constant interval between the individual teeth. This interval is generally in the range from 20 to 40 mm and is preferably from 25 to 35 mm. During the investigations for the present invention, it was found that it is advantageous to arrange the thermopins at different intervals over the width of a die. The different 25 intervals of the thermopins to one another are generally in the range from 5 to 30 mm. Correspondingly, the comb strip for this embodiment has tooth intervals matched to the spacing and physical size of the thermopins. It has been found that this arrangement with different intervals of the thermopins enables significantly more precise adjustment of the thickness profile over 30 the entire film width, in particular in areas which are otherwise difficult to adjust. This inventive idea can of course advantageously be used for any device in which the die gap is set by means of several adjustment elements distributed over the width of the die.

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- The thermopin (1) is surrounded by a coil-type heating/cooling cartridge (19) in such a way that the thermopin (1) can be heated or cooled. The upper end of the thermopin (16), i.e. the end remote from the die lip (10), has an external thread (17). By means of this external thread (17), the
- 5 thermopin (1) is connected to a horizontal retention strip (20) of the die lip (10). For manual adjustment of the thermopin, a bore with internal thread, which is in turn designed with a threaded pin as a differential screw connection, is incorporated into the retention strip (20).
- 10 This differential screw connection enables pre-adjustment of the die gap (12) by moving the thermopin (1) upwards or downwards in overall terms by screwing the differential screw connection. The fine adjustment of the die gap (12) is carried out by warming or cooling the thermopin (1). On warming, the thermopin (1) expands and exerts a pressure on the lip nose (11) and thus reduces the gap (12), i.e. on warming of the thermopin (1) the gap (12) becomes narrower at this point. Conversely, the thermopin (1) contracts on cooling and increases the die gap (12) at this point. In order to enable punctiform introduction of force into the lip nose (11) even under the action of tension, the clamp-type socket (7) is preferably designed with a
- 15 chamfered claw (21).
- If desired, instead of a thermopin which changes its longitudinal expansion as a function of temperature, it is also possible to employ an adjustment pin which works piezomechanically or magnetostrictively or is operated by
- 25 electrochemical volume changes. Also conceivable are adjustment pins which are only operated mechanically and which may likewise be advantageously modified in accordance with the present invention. The pin design and fixing in accordance with the invention advantageously act in an equivalent manner.
- 30 The shaping of the thermopin (1) in accordance with the invention with a tapered, preferably pointed end (3) and the preferably chamfered claw (21) results in very precise adjustment of the die gap (12). Since the thermopin (1) only presses onto the lip nose (11) with its pointed tip (3) during warming and pulls in a punctiform manner at the lip nose (11) with the
- 35

- chamfered claw (21) of the clamp-type socket (7) during cooling, the effect of the adjustment of this die pin zone on the adjacent die pin zones on the left and right is greatly reduced. The die deforms in a spatially more narrowly restricted region, i.e. essentially only where the thermopin (1)
- 5 acts, i.e. exerts a pressure or tension. The design according to the invention of the lower end of the thermopin (2) and of the clamp-type socket (7) is an improvement upon the prior art by facilitating a more direct and precise die gap (12) adjustment using the thermopins (1) which is improved compared with the prior art.
- 10 In order to promote this positive effect even more, the lip nose (11) may be slotted. These slots promote a narrow-band elastic line of the die lip when the thermopin (1) acts on the die lip (10). It is particularly favorable here for the slot intervals to correspond to the intervals of the thermopins (1).
- 15 The warming of the thermopin (1) by the coil-type heating/cooling cartridge (19) is preferably carried out by means of an electric, spirally open wound heating coil which is passed around the thermopin (1) and connected to electric supply lines, these supply lines themselves being connected to a
- 20 terminal box (18). In accordance with the supply of current, the heating coil and thus the thermopin (1) are heated. The arrangement comprising thermopin (1) and heating coil is surrounded by a closed jacket and in its entirety forms a tubular heating element. The cooling of the thermopin (1) is carried out by inflow of a cooling medium, preferably air, into the free space
- 25 between the heating coil and the jacket of the tubular heating element, which in turn runs, as an open spiral, parallel to the spiral of the heating coil. This arrangement in its entirety forms the coil-type heating/cooling cartridge (19). This preferred design contributes to rapid and efficient thermopin adjustment and thus to an immediate adjustment of the die gap
- 30 (12).
- Conventional heating/cooling devices for thermopins are designed with spirally closed wound heating coils, which heat the thermopin over the entire surface from the inside or from the outside. In this arrangement, the
- 35 cooling is then carried out as indirect cooling via full-area cooling of the

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- heating coil positioned externally. Alternatively, the cooling is carried out as direct, full-area cooling of the outside in the case of a heating coil located on the inside or direct, full-area cooling of the inside in the case of a heating coil located on the outside. The thermopin here must be designed
- 5 as a hollow pin, which causes considerable mechanical weakening of the thermopin and reduces the life and load-bearing capacity of the thermopin. The coil-type heating/cooling cartridge (19) design according to the invention has the following essential advantages over the conventional thermopins:
- 10 • Direct heat transfer from the coil-type heating/cooling cartridge (19) to the thermopin (1) is possible.
- 15 • There is no weakening of the thermopin (1) by the hole bore. This allows a greater adjustment range.
- 20 • Individual control of the heating and cooling is possible for each individual thermopin (1).
- 25 Both the supply lines to the heating coil and the inlet and outlet air line are preferably connected to the coil-type heating/cooling cartridge (19) via plug connections. In order to replace a thermopin (1), all connections can be detached quickly and easily. The plug connections to the heating coil and cooling lines are detached, the clamp-type socket (7) at the lower end of the thermopin (2) is detached, and the fixing to the retention strip (2) is detached. This enables the entire thermopin adjustment unit with the thermopin (1) and the coil-type heating/cooling cartridge (19) to be removed easily from the die arrangement. Time-saving replacement of individual worn parts is thus readily possible. The device according to the
- 30 invention is thus extremely maintenance-friendly and enables the replacement of individual elements with extremely short production stoppages.

Patent Claims

1. Device for adjusting the gap of a die arrangement using a thermopin, in which the thermopin is connected to the die lip (10) without any play and
5 this play-free fixing of the thermopin (1) to the die lip (10) is effected by means of a clamp-type socket (7), where said clamp-type socket (7) engages on the one hand in a lip nose (11) and on the other hand in a groove (5) of the thermopin (1), where the lip nose (11) is an integral part of the die lip (10) and the clamp-type socket (7) has a bore (8) and the
10 thermopin (1) has a bore (4) and a fixing means is passed through the bores (8) and (4).
2. Device according to Claim 1, characterized in that the lower end of the thermopin (2), which is in contact with the lip nose (11), tapers off,
15 preferably terminating in a pointed tip (3).
3. Device according to one or more of Claims 1 and/or 2, characterized in that the bore (4) of the thermopin is provided between the tapered end and the groove (5) of the thermopin.
20
4. Device according to one or more of Claims 1 to 3, characterized in that a comb strip (14) is attached to the die lip (10), and the thermopins (1) are inserted between the individual teeth of the comb strip (14) on fixing to the die lip (10).
25
5. Device according to one or more of Claims 1 to 4, characterized in that the comb strip (14) is a separate part which is reversibly fixed to the die lip (10).
- 30 6. Device according to one or more of Claims 1 to 5, characterized in that the thermopin (1) is surrounded by a coil-type heating/cooling cartridge (19).

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7. Device according to one or more of Claims 1 to 6, characterized in that the coil-type heating/cooling cartridge warms the thermopin via an electric, spirally open wound heating coil.
- 5 8. Device according to Claim 7, characterized in that the cooling of the thermopin (1) is effected by the inflow of a cooling medium into the free space between the heating coil and the jacket of the tubular heating element.
- 10 9. Device according to one or more of Claims 1 to 8, characterized in that the thermopin has, at the upper end remote from the die lip, an external thread via which it is connected to a horizontal retention strip (18), the retention strip having a corresponding bore with internal thread.
- 15 10. Slot die, characterized in that at least one thermopin according to one of Claims 1 to 9 is fixed to the die lip (10) without any play.
11. Slot die according to Claim 10, characterized in that the lip nose (11) has slots, and the intervals between these slots correspond to the intervals 20 of the thermopins.
12. Method for adjusting the gap of a slot die, characterized in that the change in the height of the die gap is carried out using thermopins according to one of Claims 1 to 9.
- 25 13. Device for adjusting the gap of a die arrangement by means of mechanically acting elements arranged over the width of the dies, characterized in that the intervals between the elements are not all identical, i.e. the elements are arranged at different intervals.
- 30 14. Device according to Claim 13, characterized in that the intervals between the elements in the edge region of the die are closer than the intervals between the elements in the central region of the die.

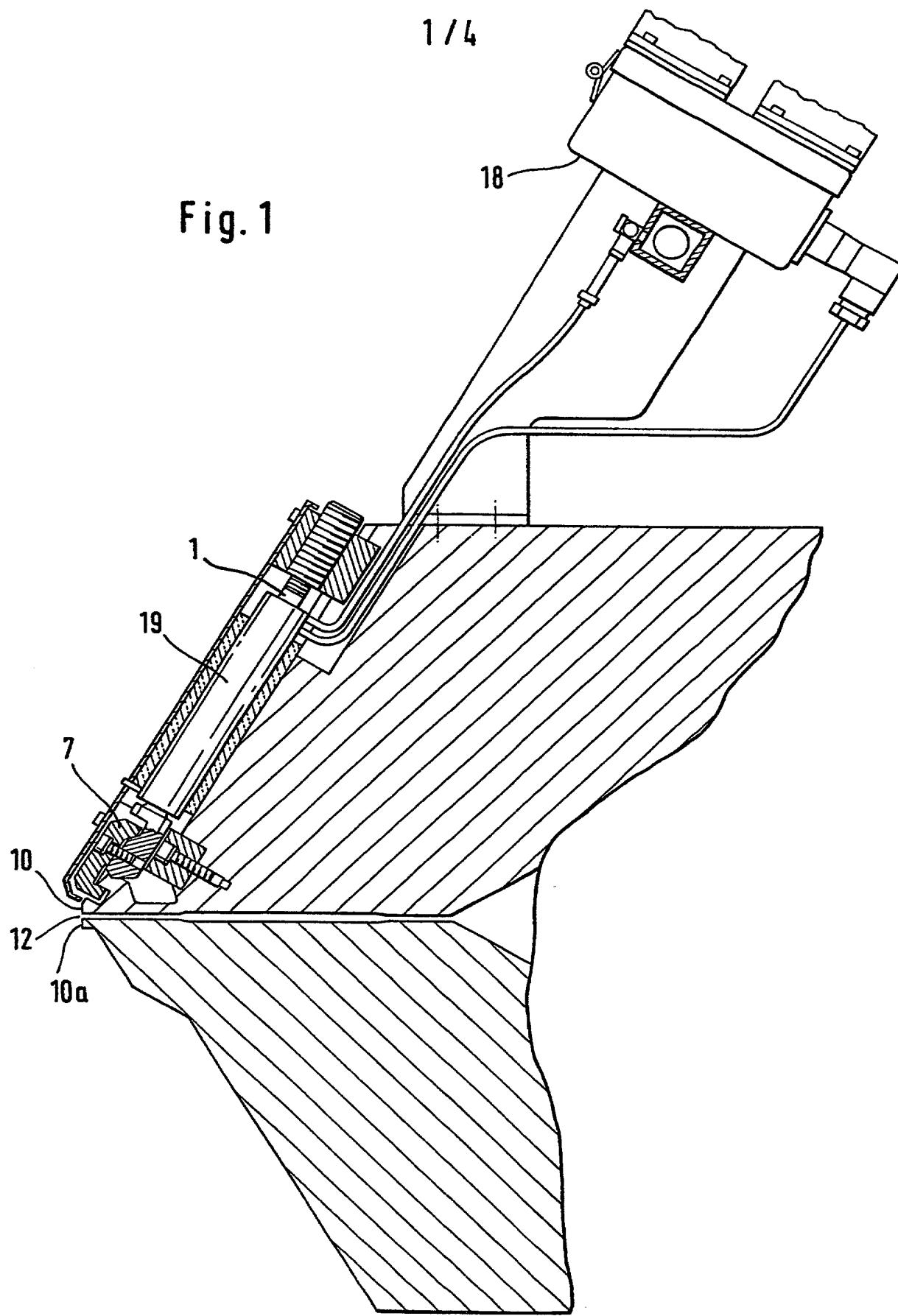
- 11 -

15. Device according to Claim 13, characterized in that the intervals between the elements in the central region of the die are closer than the intervals between the elements in the edge region of the die.

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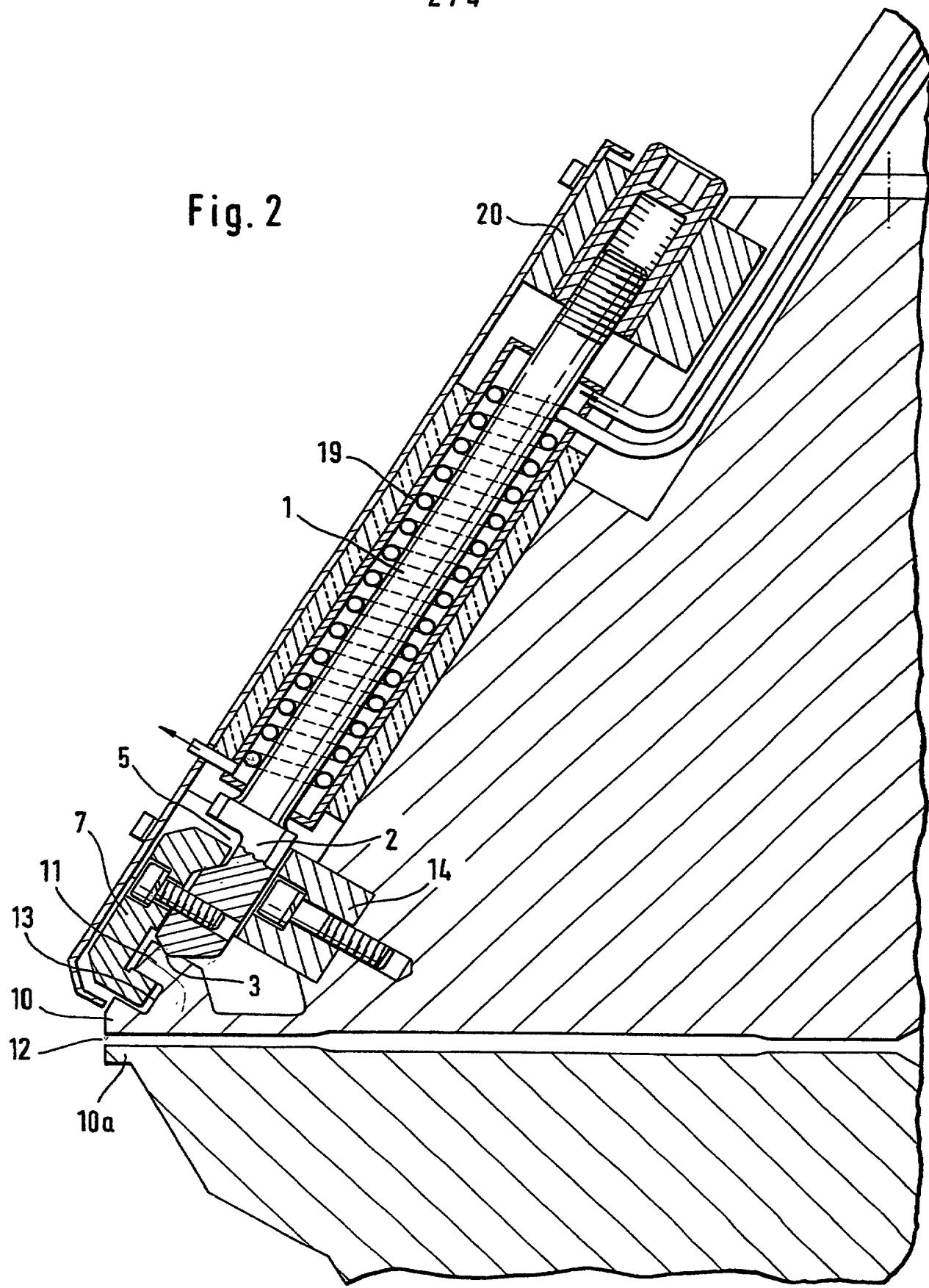
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Fig. 1



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Fig. 2



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Fig. 4

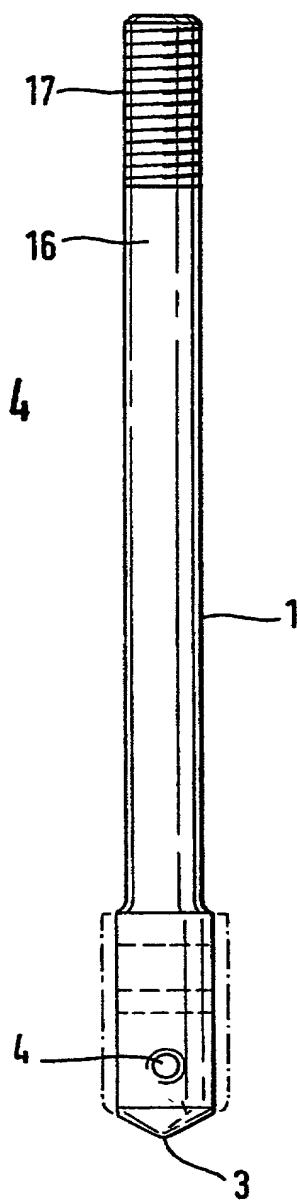


Fig. 3

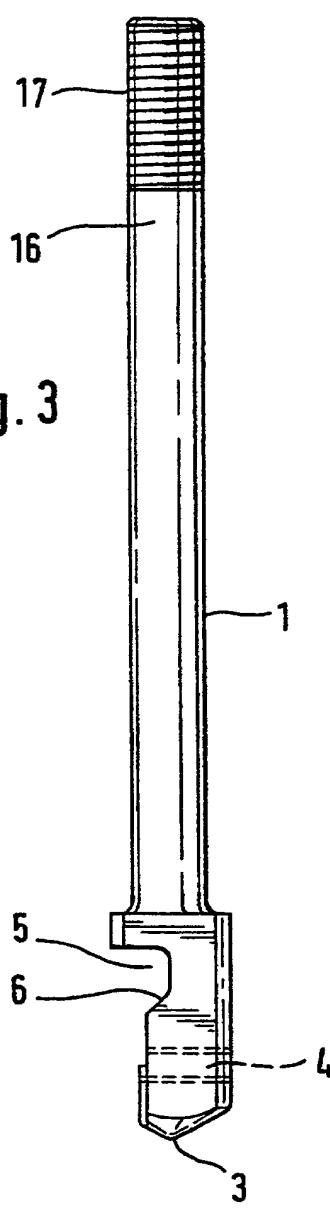
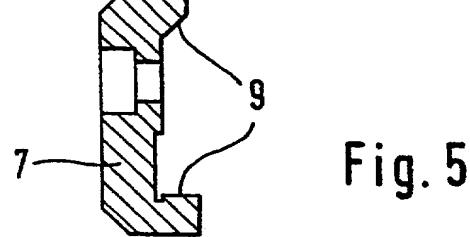
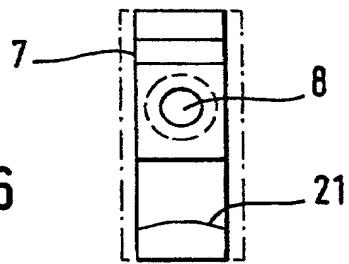


Fig. 6



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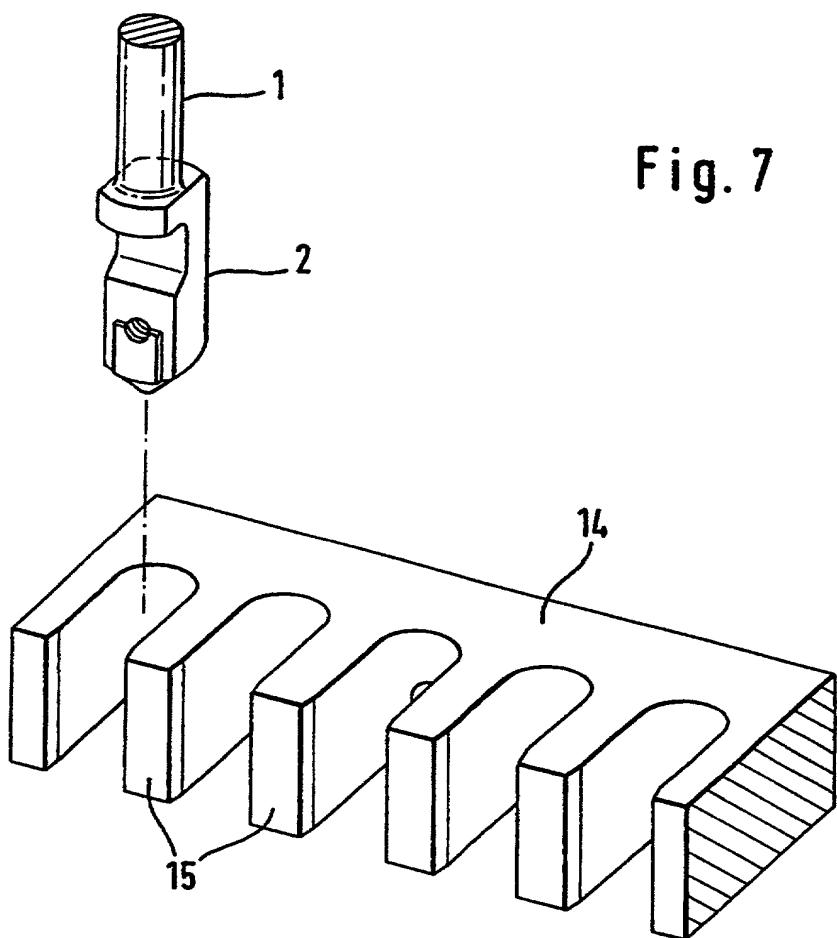
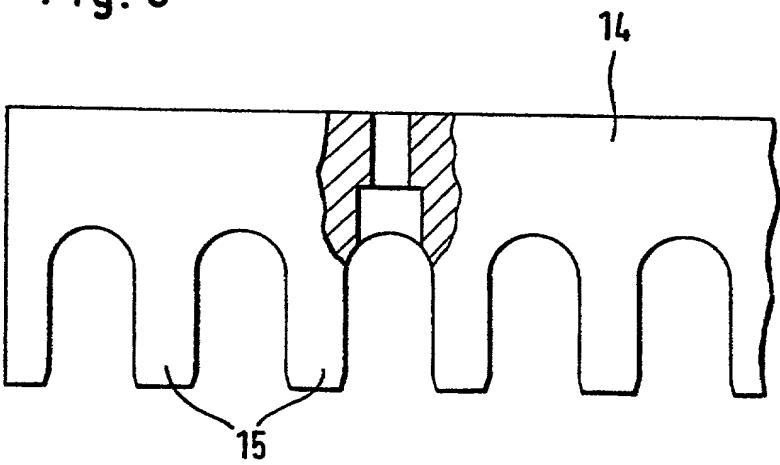


Fig. 8



DECLARATION AND POWER OF ATTORNEY



As a below named inventor, I hereby declare that:

My residence, post office address and citizenship are as stated below next to my name,

I believe I am the original, first and sole inventor (if only one name is listed below) or an original, first and joint inventor (if plural names are listed below) of the subject matter which is claimed and for which a patent is sought on the invention entitled

The specification of which (check one)

is attached hereto.
 was filed on _____ as Application
Serial No. _____ and was amended on

(if applicable).

I hereby state that I have reviewed and understand the contents of the above identified specification, including the claims, as amended by any amendment referred to above.

I acknowledge the duty of disclose information which is material to the examination of this application in accordance with Title 37, Code of Federal Regulations, section 1.56.

I hereby claim foreign priority benefits under Title 35, United States Code, section 119(a)-(d) of any foreign application(s) for patent or inventor's certificate listed below and have also identified below any foreign application for patent or inventor's certificate having a filing date before that of the application on which priority is claimed:

PRIOR FOREIGN APPLICATION(S)

Priority Claim

198 55 751.5 (Number)	DE (Country)	03. December 1998 (Day/Month/Year filed)	Yes No
PCT/EP 99/09310 (Number)	WO (Country)	30. November 1999 (Day/Month/Year filed)	Yes No
(Number)	(Country)	(Day/Month/Year filed)	Yes No
(Number)	(Country)	(Day/Month/Year filed)	Yes No

I hereby claim the benefit under Title 35, United States Code, §119(c) of any United States Provisional application(s) listed below:

PRIOR PROVISIONAL APPLICATIONS

(application serial number)	(Month / Day / Year filed)
(application serial number)	(Month / Day / Year filed)

I hereby claim the benefit under Title 35, United States Code, section 120 of any United States application(s) listed below and, insofar as the subject matter of each of the claims of this application is not disclosed in the prior United States application in the manner provided by the first paragraph of Title 35, United States Code, section 112. I acknowledge the duty to disclose material information as defined in Title 37, Code of Federal Regulations, section 1.56 which became available between the filing date of the prior application and the national or PCT international filing date of this application:

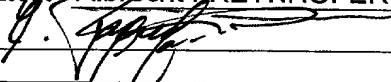
Application Serial No.	Filing Date	Status - patented, pending, abandoned
_____	_____	_____
_____	_____	_____
_____	_____	_____
_____	_____	_____

DECLARATION AND POWER OF ATTORNEY

I hereby declare that all statements made herein of my own knowledge are true and that all statements made on information and belief are believed to be true; and further that these statements were made with the knowledge that willful false statements and the like so made are punishable by fine or imprisonment, or both, under Section 1001 of Title 18 of the United States Code and that such willful false statements may jeopardize the validity of the application or any patent issued thereon.

16
I hereby appoint Jeffrey Kushan, Reg. No. 43,401, Thomas T. Moga, Reg. No. 34,881, Richard Wilder, Reg. No. 31,202, David Fitzgerald, Reg. No. 47,347 and Dennis Cawley, Reg. No. 44,598, David W. Woodward, Reg. No. 35,020, and each principal, attorney of counsel, associate and employee of Powell, Goldstein, Frazer & Murphy, LLP, who is a registered Patent Attorney, my attorney with full power of substitution and revocation, to prosecute this application and to transact all business in the Patent and Trademark Office connected therewith. I request the Patent and Trademark Office to direct all correspondence and telephone calls relative to this application to Powell, Goldstein, Frazer & Murphy, LLP, P.O. Box 97223, Washington D.C. 20090-7223, (202) 347-0066.

Full name of sole or first inventor: Albrecht FREYNHOFER

Inventor's signature: 

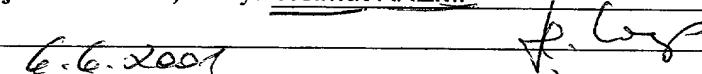
Date: 06.06.01

Residence: HAUPTSTRASSE 76, D-66578 SCHIFFWEILER, GERMANY 

Citizenship: German

Post Office Address: same as residence

Full name of second joint inventor, if any: Helmut KREMP

Inventor's signature: 

Date: 6.6.2001

Residence: BRUCKENFELD 46, D-66557 ILLINGEN, GERMANY 

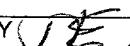
Citizenship: German

Post Office Address: Same as residence

Full name of third joint inventor, if any: Dieter MATHIEU

Inventor's signature: 

Date: 08.06.2001

Residence: FELDSTRASSE 41, D-66546 OTTWEILER, GERMANY 

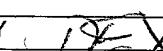
Citizenship: German

Post Office Address: Same as residence

Full name of fourth joint inventor, if any: Wolfgang RASP

Inventor's signature: 

Date:

Residence: UNTERER BRUNNENWEG 11A, D-66424 HOMBURG, GERMANY 

Citizenship: German

Post Office Address: Same as residence

DECLARATION AND POWER OF ATTORNEY

As a below named inventor, I hereby declare that:

My residence, post office address and citizenship are as stated below next to my name.

I believe I am the original, first and sole inventor (if only one name is listed below) or an original, first and joint inventor (if plural names are listed below) of the subject matter which is claimed and for which a patent is sought on the invention entitled

DEVICE FOR ADJUSTING A GAP

The specification of which (check one)

is attached hereto.
 was filed on _____ as Application
Serial No. _____ and was amended on

(if applicable).

I hereby state that I have reviewed and understand the contents of the above identified specification, including the claims, as amended by any amendment referred to above.

I acknowledge the duty of disclose information which is material to the examination of this application in accordance with Title 37, Code of Federal Regulations, section 1.56.

I hereby claim foreign priority benefits under Title 35, United States Code, section 119(a)-(d) of any foreign application(s) for patent or inventor's certificate listed below and have also identified below any foreign application for patent or inventor's certificate having a filing date before that of the application on which priority is claimed:

PRIOR FOREIGN APPLICATION(S)

				<u>Priority Claim</u>
<u>198 55 751.5</u> (Number)	<u>Germany</u> (Country)	<u>03 December 1998</u> (Day/Month/Year filed)	<input checked="" type="checkbox"/> Yes	<input type="checkbox"/> No
<u>WO 00/32375</u> (Number)	<u>PCT</u> (Country)	<u>08 June 2000</u> (Day/Month/Year filed)	<input checked="" type="checkbox"/> Yes	<input type="checkbox"/> No
<u>(Number)</u>	<u>(Country)</u>	<u>(Day/Month/Year filed)</u>	<u>Yes</u>	<u>No</u>

I hereby claim the benefit under Title 35, United States Code, §119(e) of any United States Provisional application(s) listed below:

PRIOR PROVISIONAL APPLICATIONS

(application serial number) _____ (Month / Day / Year filed) _____
(application serial number) _____ (Month / Day / Year filed) _____

I hereby claim the benefit under Title 35, United States Code, section 120 of any United States application(s) listed below and, insofar as the subject matter of each of the claims of this application is not disclosed in the prior United States application in the manner provided by the first paragraph of Title 35, United States Code, section 112. I acknowledge the duty to disclose material information as defined in Title 37, Code of Federal Regulations, section 1.56 which became available between the filing date of the prior application and the national or PCT international filing date of this application:

Application Serial No.	Filing Date	Status – patented, pending, abandoned
_____	_____	_____
_____	_____	_____
_____	_____	_____

DECLARATION AND POWER OF ATTORNEY

I hereby declare that all statements made herein of my own knowledge are true and that all statements made on information and belief are believed to be true; and further that these statements were made with the knowledge that willful false statements and the like so made are punishable by fine or imprisonment, or both, under Section 1001 of Title 18 of the United States Code and that such willful false statements may jeopardize the validity of the application or any patent issued thereon.

I hereby appoint David W. Woodward, Reg. No. 35,020, Jeffrey Kushan, Reg. No. 43,401, Thomas T. Moga, Reg. No. 34,881, Richard Wilder, Reg. No. 31,202, David Fitzgerald, Reg. No. 47,347 and Dennis Cawley, Reg. No. 44,598, and each principal, attorney of counsel, associate and employee of Powell, Goldstein, Frazer & Murphy, LLP, who is a registered Patent Attorney, my attorney with full power of substitution and revocation, to prosecute this application and to transact all business in the Patent and Trademark Office connected therewith. I request the Patent and Trademark Office to direct all correspondence and telephone calls relative to this application to Powell, Goldstein, Frazer & Murphy, LLP, P.O. Box 97233, Washington, D.C. 20090-7233, (202) 347-0066.

Full name of sole or first inventor: Albrecht FREYNHOFER

Inventor's signature: _____

Date: _____

Residence: SCHIFFWEILER

Citizenship: Germany

Post Office Address: Hauptstrasse 76, D-66578 Schiffweiler

Full name of second joint inventor, if any: Helmut KREMP

Inventor's signature: _____

Date: _____

Residence: Illingen

Citizenship: Germany

Post Office Address: Brückfeld 46, D-66557 Illingen

Full name of third joint inventor, if any: Dieter MATHIEU

Inventor's signature: _____

Date: _____

Residence: OTTWEILER

Citizenship: Germany

Post Office Address: Feldstrasse 41, D-66546 Ottweiler

Full name of fourth joint inventor, if any: Wolfgang, RASP

Inventor's signature: _____

Date: _____

Residence: HOMBURG

Citizenship: Germany

Post Office Address: Unterer Brunnenweg 11a, D-66424 Homburg

W. Rasp 4-5-2001

Full name of fifth joint inventor, if any: _____

Inventor's signature: _____

Date: _____

Residence: _____

Citizenship: _____

Post Office Address: _____

:ODMA\PCDOCS\WSF\219143\1